THE AMERICAN
JOURNAL OF PHARMACY

NOVEMBER, 1899.

A NOTE ON POWDERED DRUGS.

By Melvin William Bamford, P.D.

In a paper published in the *Pharm. Zeit.*, 1898, p. 685, Dieterich has shown that the amount of ash yielded by the fine and coarse parts of the powder of certain drugs varies with the fineness of the powder. As to what these different powders consisted of, no mention whatever was made, so that we do not know whether they consisted solely or in part of parenchyma, epidermis, or any other tissues, or indeed foreign matter, as no microscopical examination of the different powders was made.

Although Dieterich did, in drawing his conclusions, state that he presumed this difference in ash was caused by the separation of tissues, and, therefore, the separation of their constituents, as crystals, alkaloids, etc., into the separate powders, this statement was made without any attempt being made to prove such to be the case. His experiments, therefore, simply proved this difference in ash, without assigning any definite cause for it. Dieterich did not show that fine and coarse powders of the same drug did not yield the same percentage of ash, although this might have been assumed from the results shown.

In order to be clear on these various points, and to determine, if possible, the causes underlying them, the author of the present paper, at the suggestion of Professor Henry Kraemer, carried out a number of experiments in the Microscopical Laboratory of the Philadelphia College of Pharmacy. In the first of these experiments senna was the drug used.

Senna leaves were cut up so as to all go through a No. 8 sieve,

and another lot ground so as to all pass through a No. 80 sieve. Two ash determinations on each of these powders resulted as follows:

No 8—(*a*) 10·19 per cent.; (*b*) 9·89 per cent.

No. 80—(*a*) 10·50 per cent.; (*b*) 9·93 per cent.

Allowing for discrepancies which must occur in such work, these results show that practically there is no difference in the percentage of ash.

The next determinations were made on three powders, Nos. 8, 30 and 80, which were obtained by separating a coarsely ground powder of the same lot of senna into powders of the above degrees of fineness. Two ash determinations were made on each of these powders, with the following results:

No. 8—(*a*) 10·17 per cent.; (*b*) 10·20 per cent.

No. 30—(*a*) 10·85 per cent.; (*b*) 10·64 per cent.

No. 80—(*a*) 10·96 per cent.; (*b*) 10·70 per cent.

These results, although showing a slight increase with the fineness of the powder, do not show anything like the same increase shown in Dieterich's work.

Since this difference was supposed to be due to the different tissues in the several powders, it was thought desirable to use some drug in which the tissues could be separated. This drug was found in ipecac. A lot of ipecac was procured and in a part of it the bark was separated from the wood. (Incidentally it was found that the bark constituted about 80 per cent. of the drug.) The percentage of ash found in these parts, two determinations being made in each case, was as follows:

Bark—(*a*) 2·44 per cent.; (*b*) 2·45 per cent.

Wood—(*a*) 1·69 per cent.; (*b*) 1·47 per cent.

It will be noticed here that the bark yields about 1 per cent. more ash than the wood, which is partly due to the fact that all the crystals of calcium oxalate are contained in the bark, and partly to another fact which will be shown later.

Next a quantity of the same drug, ground to a coarse powder, was divided into powders of different degrees of fineness. Ash determinations were then made on two of these powders, that which passed through a No. 80 sieve and that which did not pass through a No. 20 sieve. These resulted as follows:

Coarser than No. 20—(*a*) 2·14 per cent.; (*b*) 1·90 per cent.

No. 80—(*a*) 12·35 per cent.; (*b*) 12·54 per cent.

These results show a remarkable difference in the percentage of ash, and to determine, if possible, the cause, the powders were examined microscopically. The coarse powder was found to consist principally of woody tissue and a small percentage of bark. There was practically no foreign matter present in this powder. The No. 80 powder was found to consist of bark principally, raphides of calcium oxalate, and quite a large percentage of foreign matter, most of which, on further examination, proved to be particles of sand. This led to still further examination to determine the cause of the presence of sand. In the package containing the crude drug, and evidently separated from it in handling, was found a quantity of a fine powder which, on examination, proved to be largely sand and other foreign matter. Some of the root was then carefully scraped so as to remove from the surface any adherent particles of dirt, and these scrapings were also found to be composed principally of sand.

Naturally, when the drug was powdered these particles of sand and other foreign matter were separated and passed through the sieve with the finest part of the powder. Since the fine powder used in the above determinations was but a small part of the whole powder, the presence of this inorganic matter must necessarily increase the percentage of ash very greatly, and hence the remarkable difference found in these powders. And also this matter being all attached to the bark would increase the ash percentage of the bark over that of the wood. This has been practically shown in the above estimations.

The senna used in these experiments was an especially clean lot of the drug, and possibly an explanation of the great difference in these results and those of Dieterich may be found to be that the drug used in his experiments contained foreign matter of the same nature as that found in the ipecac used for these experiments.

BOTANICAL SOURCE OF MYRRH.—From specimens collected by Mr. and Mrs. Philips it appears that the plant recognized by the Somalis as the source of myrrh is that figured in Bentley and Trimen's "Medicinal Plants."—*Ph. Jour.* (London), 1899, p. 295.

NEW EUCALYPTUS SPECIES.—R. T. Baker ("Proc. Linn. Soc. N. S. W.," 1898) describes two new species: (1) *E. dextropinea*, the volatile oil (0·85 per cent.) of which consists largely of a dextro-rotatory pinene, eucalyptol being absent. (2) *E. lævopinea*, the volatile oil (0·85 per cent.) being made up largely of lævo-rotatory pinene, but contains neither eudesmol nor eucalyptol.

FURTHER WORK UPON THE ESTIMATION OF ALKALOIDS AND THE ASSAY OF ALKALOIDAL DRUGS.[1]

By H. M. Gordin and A. B. Prescott.

In a paper presented by us a year ago,[2] we offered a method for the volumetric estimation of alkaloids by use of standard solution of iodine. We then reported upon the method for use with six alkaloids, morphine, atropine, strychnine, brucine, caffeine and aconitine. And we had succeeded in making the method a trustworthy and convenient one for five of these alkaloids,[3] all those just named except aconitine. In each instance we had obtained in purity the higher periodide of the alkaloid, the one formed in our method of estimation, and had found the analysis of this periodide to give a molecular factor which was closely verified when put to the volumetric test. A volumetric method, of course, requires that the alkaloid be first brought into aqueous solution, nearly free from other matters. In the case of opium we had reported a method of extraction from the crude drug, together with the volumetric estimation of the morphine, in one assay process, having advantages of a nearer approach to complete recovery of the morphine content, and of promptness of operation. As to methods of extraction for other crude drugs, we mentioned a year ago that we had work in hand, and said that it was too early, as yet, to make definite proposals for pharmacopœial adoption of the method for any of the alkaloidal drugs or galenicals.

During the past year we have worked upon the application of the iodometric method to five more alkaloids, emetine, hydrastine, berberine, colchicine and quinine, and have already made the method entirely satisfactory for emetine, berberine and hydrastine. For berberine the estimation, though iodometric in one sense, rests on the formation of an insoluble hydriodide instead of a periodide, and re-

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[1] In the work of Research Committee D, Section 2, Committee of Revision and Publication of the Pharmacopœia of the United States, 1890–1900. Read at the meeting of the American Pharmaceutical Association, September, 1899.

[2] "Certain Alkaloidal Periodides and the Volumetric Estimation of Alkaloids as Higher Periodides." A. B. Prescott and H. M. Gordin, "Proc. Am. Phar. Assoc.," 1898, p. 355.

[3] For caffeine the method had been completed, with analysis of the periodide and other perhalides, by Gomberg, in this Laboratory, in 1896.

quires volumetric solutions different from those used with all the other alkaloids. We have also elaborated the volumetric process to the separation of strychnine from brucine. In the case of colchicine, the formation of a uniform periodide presented difficulties, but we hope to return to the investigation of this alkaloid, as well as to that of aconitine. Respecting quinine, we have in hand work upon its separation, but we are not confident of making any improvement over existing methods.

To work out a general method of analytical extraction of alkaloids from crude drugs, bringing the alkaloids of drugs completely into solution suitable for almost any volumetric or gravimetric estimation, has been a problem undertaken in our work during the past year. We were invited to this problem, in fact, by the unexpected advantages of the procedure we had adopted for extraction in opium assay, and by a desire to adapt the same procedure to other and ordinary alkaloidal drugs. The opium assay process we have materially improved this year. In result we now desire to offer such a method for the extraction of alkaloids in process of estimation, especially for use in volumetric estimation, whether such volumetric way be on the iodometric plan, or upon the alkalimetric plan, the latter having received a quite favorable consideration at the hands of analysts.

In this paper we beg leave to give some further experimental data, upon which we have based the methods which we propose for alkaloidal assay, and therewith very brief discussion of the claims of these methods in comparison with others.

In an accompanying paper (See AMER. JOUR. PHARM., 1899, p. 462) we give, in short compass, the bare directions for assay, namely, for alkaloidal extraction in general, for iodometric estimation in general, with a list of iodine factors for alkaloids, the assay of nux vomica, of ipecacuanha and opium assay.

We give the simple directions for assays, disencumbered of reports of our experimental work, for the easier use of analysts while under the working pressure of industrial laboratories, where all devices for the valuation of drugs ought, if possible, to come to trial before adoption into the text of a national pharmacopœia. But whether for consideration by any national committee of revision or for the attention of individual chemists anywhere, it is our desire to give, if we can, some addition to the resources of analysts, well

knowing how portentous are the demands now made, both by legal enactments and by commercial contracts, upon the faithful services of the devoted analyst, who is not seldom called upon to do without delay more than all the world of research has ever done before him.

THE PERIODIDES OF EMETINE.[1]

Emetine seems to form two periodides, according to whether the iodine is added to the alkaloid or *vice versa*, but owing to lack of material we have only isolated and analyzed one, namely, the higher periodide. The emetine used was obtained from Merck & Co. The periodide was made by pouring 200 c.c. of a solution of emetine in acidulated water, this solution containing about ½ per cent. of the alkaloid, into about 500 c.c. of a solution which contained about 1 per cent. of iodine with $1\frac{5}{10}$ per cent. of potassium iodide, and was strongly acidulated by hydrochloric acid. The mixture was skaken till the supernatant liquid became perfectly transparent, the precipitate was separated by means of the pump, quickly washed with cold water and then dried, first on porous plates and then in vacuo over sulphuric acid.

Thus obtained, the periodide is a dark brown powder, hardly soluble in benzol, ether or chloroform, quite soluble in alcohol, and very soluble in a mixture of four parts of alcohol and one of chloroform. The chloroform greatly increases the solubility of the periodide in alcohol, though chloroform alone hardly dissolves it. So far we have not been able to recrystallize it. On evaporation of the solvent a viscous mass is generally left. Authorities differ with regard to the formula of emetine, as follows:

Lefort and Wurtz[2]	$C_{28}H_{40}N_2O_5 = 482{\cdot}98$
Glenard[3]	$C_{30}H_{44}N_2O_4 = 494{\cdot}96$
Kunz[4]	$C_{30}H_{40}N_2O_5 = 506{\cdot}92$
Paul and Cownley[5]	$C_{15}H_{22}NO_2 = 247{\cdot}48$

Our periodide corresponds best to the formula of Lefort and Wurtz. Adopting that, provisionally, we have an emetine hydriodide heptiodide, $C_{28}H_{40}N_2O_5.HI.I_7$.

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[1] Included in a paper published in *Phar. Review*, Vol. 17 (1899).

[2] *Ann. Chim. Phys.* (5), 12, 247.

[3] *Ibid.* (5), 8, 233.

[4] *Arch. d. Pharm.*, 225 (1887), 461; 232 (1894), 466.

[5] *Pharm. J.* (3), 24, 61.

For the estimation of the additive iodine the periodide was dissolved in chloroform mixed with alcohol and titrated with standardized thiosulphate, using starch as indicator. It is best to add first an excess of the thiosulphate solution, then add considerable water, when the excess is titrated back with standardized iodine. For the total iodine the periodide is dissolved in a little chloroform mixed with a few drops of alcohol; powdered zinc is then added and the mixture kept on a water-bath till effervescence (from the action of zinc on the chloroform) ceases. To the mixture, when cold, ammonia water is added, and the iodine in the zinc and ammonium iodide is estimated exactly as described in the analysis of morphine tetraiodide.[1]

For additive iodine, 0·1492 gramme of the periodide gave 0·0880045 gramme iodine, and 0·122 gramme gave 0·0727250 gramme iodine.

	Calculated for $C_{28}H_{40}N_2O_5.HI.I_7$.	Found.
1	59·24	59·98
2	59·24	59·61

For total iodine, 0·1313 gramme of the periodide gave 0·0890502 gramme iodine, and 0·12095 gramme gave 0·0818797 gramme iodine.

	Calculated for $C_{28}H_{40}N_2O_5.HI.I_7$.	Found.
1	67·69	67·82
2	67·69	67·69

From these results we draw the provisional iodine factor of the alkaloids of ipecacuanha, 1·00 of iodine = 0·55 of alkaloids.

PERIODIDES OF HYDRASTINE.[2]

The higher periodide is of a very dark brown color, very difficultly soluble in ether, benzol or cold chloroform, more easily in hot chloroform and in alcohol, and very easily in a mixture of alcohol and chloroform, or alcohol and ether. It melts in hot water. Attempts to crystallize it failed. It is obtained when the dilute alkaloid solution is slowly added to a large excess of iodine dissolved with potassium iodide in water. So made, it is constant

[1] "Proc. Am. Pharm. Assoc.," 1897, p. 340, *et. seq.*

[2] This body was reported upon in full in an article in AM. JOUR. PHARM., 71, 257 (1899).

in composition, hydrastine hydriodide pentaiodide, as determined by a preparation and analysis as described in previous papers.[1]

	Calculated for $C_{21}H_{21}NO_6HI.I_5$.	Found. I.	Found. II.
Additive iodine	55·43	55·30	55·34
Total iodine	66·52	66·86	66·06

The lower periodide of hydrastine, formed when the iodine solution is added to the alkaloidal salt solution, is from light brown to dark brown in color. It is not constant in composition, and was only obtained as an approach to a triiodide. Prepared and analyzed, it gave figures as follows:

	Calculated for $C_{21}H_{21}NO_6HI.I_3$.	I.	II.	III.	IV.
Additive iodine	33·22	35·76	36·07	36·33	36·02
Total iodine	49·83	50·01	49·74	—	—

IODOMETRIC ESTIMATION OF HYDRASTINE.[2]

The exclusive formation of the hexiodide is insured by slowly adding a weak alkaloidal solution to a large excess of the iodine solution, and proceeding as directed for other iodometric estimations.[3] The iodine factor for hydrastine is 0·60403 (382·14 : 5 x 126·53 : : 0·60403 : 1). This factor was verified in the estimation of solutions of 0·3 per cent. and of 0·15 per cent. of hydrastine.

ASSAY OF HYDRASTIS.

Ten grammes of the finely powdered hydrastis are rubbed up to a paste with a few cubic centimetres of a mixture of alcohol and stronger ammonia, each, 5 c.c., and ether, 30 c.c., in an 8-ounce screw-top ointment jar, and a few cubic centimetres more of the same mixture are then added, so as to have the powder well covered with liquid. The small pestle is then left inside, and the jar, well covered, is set aside over night. The jar is then opened, put into a good current of air till the odor of ammonia has disappeared, and then in a vacuum over sulphuric acid for about five or six

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[1] "Proc. Amer. Pharm. Assoc.," 1898, pp. 358, 364.

[2] We are indebted to Prof. John U. Lloyd for a specially prepared sample of hydrastine. We had also a sample in a lot of pure alkaloids furnished by Merck & Co., and the latter agreed very well with the former in the quantitative results.

[3] See an accompanying paper, "Directions for Alkaloidal Assays," AMER. JOUR. PHARM., 1899, p. 462.

hours. The powder is then put into a filter-paper cell, placed in a Soxhlet extraction apparatus, the jar rinsed out several times with powdered glass, or, in the absence of this, with coarsely powdered barium nitrate, the rinsings added to the Soxhlet, the latter connected with an Erlenmeyer flask containing about 40 or 50 c.c. absolute ether, and the extraction conducted in the usual way, till a few drops after evaporation of the ether and acidulation give no reaction with Mayer's or Wagner's reagent. The ethereal extract will be found to have only a very slight yellow color. The Erlenmeyer is then detached from the Soxhlet, the ether poured out into a flat evaporating dish, the Erlenmeyer washed out several times with water containing about 2 per cent. sulphuric acid, the washings added to the contents of the evaporating dish, and the latter put into a draught at about 30° C., till the ether has disappeared.

The contents of the dish are poured into a 100 c.c. flask, the dish washed, the washings added in the flask, and the latter filled up to the 100 c.c. mark. The solution containing hydrastine sulphate, and of which 10 c.c. represent 1 gramme of the root, is used for the estimation of hydrastine.

For the iodometric estimation 20 c.c. of the filtered solution (representing 2 grammes of the drug) are run from a burette into a 100 c.c. flask, containing 20 or 30 c.c. of a standardized solution of iodine of any known strength (that in the neighborhood of 1 per cent. is the best), and the analysis carried out exactly as described in the accompanying paper (AMER. JOUR. PHARM., 1899, p. 462). From the amount of iodine consumed the amount of hydrastine is deduced by using the factor of the hydrastine hexiodide, *i. e.*, 0·60403 of hydrastine for one of iodine consumed.

For a gravimetric estimation another portion of 20 c.c. of the filtered solution is run into a separator and the hydrastine shaken out with benzol and ammonia, all the coloring matter remaining in the aqueous fluid, and a perfectly colorless solution of hydrastine in benzol is obtained. The benzol solution is then filtered through a small filter into another separator, the first separator and filter washed with benzol, and the hydrastine again shaken out with water acidulated with sulphuric acid. At last, from the watery solution, the hydrastine is shaken out with ether and ammonia, the ether poured into a tared beaker and slowly evaporated in a dark place. After drying in a vacuum over sulphuric acid and paraffine,

the beaker is weighed. The hydrastine is left in perfectly white crystals, and only a slightly yellowish tint can be seen on the sides of the beaker. This tint is probably due to traces of canadine, which becomes yellow[1] on exposure to light. Of course, instead of shaking out, the method of perforation may be used if preferred.

For the estimation of berberine a current of dry air is passed through the Soxhlet till all the ether is removed, the Soxhlet connected with an Erlenmeyer containing 40 or 50 c.c. of alcohol, and the extraction continued till the alcohol comes out colorless. The alcoholic extract, containing berberine and considerable quantities of extractive matter, is poured out into an evaporating dish, the Erlenmeyer washed out with hot water and a little dilute acetic acid, the washings added to the evaporating dish, and the latter kept on a water-bath, adding water from time to time till all the alcohol has disappeared. A little more diluted acetic acid is now added, the dish covered, and when completely cold its contents are filtered into an Erlenmeyer having the capacity of about 300 or 400 c.c.[2]

Six to eight c.c. of acetone are added to the contents of the Erlenmeyer, of which the washings of the dish and the filter have been added, and then a 10 per cent. solution of sodium hydrate is added, drop by drop, till the precipitate first formed ceases to disappear on shaking, and the liquid acquires a strongly alkaline reaction. The Erlenmeyer is then stoppered and shaken in circular direction for about ten or fifteen minutes, and then set aside in a cool place for two or three hours. The berberine-acetone[3] separates out in crystals, some of which adhere to the sides of the vessel. The supernatant liquid is then poured on a small filter, the precipitate washed once or twice by decantation, and then on the filter, till the washings are colorless. The filter is then pierced

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[1] E. Schmidt, 1894; *Arch. d. Pharm.*, 232, 141.

[2] In the remaining procedure, the simplest way would be to precipitate the berberine with hydrochloric or nitric acid, but in this case a considerable amount of extractive matter contaminates the precipitate, and the estimation would fall out too high, though the error in this respect might be compensated in some extent by the solubility of the hydrochloride or nitrate in water. But the best way is to purify the berberine by converting it into berberine-acetone, regenerate the alkaloid by means of sulphuric acid, and then estimate it volumetrically by standard potassium iodide.

[3] Gaze, *Arch. d. Pharm.*, 1890, 607.

through, and, by means of the wash bottle, the precipitate is returned to the same Erlenmeyer in which the precipitation took place. In this way all loss is avoided. To the precipitate about 4 or 5 c.c. of a 5 per cent. solution of sulphuric acid is now added, and then water enough to make about 100 or 200 c.c. The Erlenmeyer is now put into hot water, when the precipitate will completely dissolve in the course of a few minutes. The solution is now poured into a long-necked flask, washing the Erlenmeyer several times, the flask put on an asbestos plate and kept very gently boiling for about an hour and a half or two hours, adding hot water from time to time if necessary.

The flask is now cooled and its contents poured out into a litre measuring flask,[1] into which there has been previously taken from a burette 100 c.c. of twentieth normal potassium iodide. The flask is washed several times, the washings added to the measuring flask, and the latter filled up to 1,000 c.c. and set aside over night. 500 c.c. are now filtered off into another litre flask, 50 c.c. of twentieth normal silver nitrate and nitric acid are added to the flask, which is filled up to 1,000 c.c., well shaken, filtered, and 500 c.c. of the filtered liquid titrated back with fortieth normal ammonia sulphocyanate, using ferric alum as indicator. Twice the number of cubic centimetres of the sulphocyanate solution used is equal to the number of cubic centimetres of the potassium iodide solution consumed by the berberine, representing 10 grammes of the hydrastis root. By multiplying the number of cubic centimetres of twentieth normal potassium iodide consumed by 0·167125, the percentage of anhydrous berberine in the root is obtained, as 1 c.c. of the potassium iodide solution is equal to 0·0167125 of berberine.

In our assay of *Hydrastis canadensis* three samples of powdered hydrastis were treated in the way described. The berberine was estimated volumetrically, the hydrastine both iodometrically and gravimetrically.

	For Hydrastine. Iodine Consumed by 2 Grammes of the Root.	Hydrastine. Iodometric.	Gravimetric.
1	0·0760015	2·29	2·29
2	0·0772012	2·33	2·30
3	0·0777770	2·35	2·28

[1] The berberine hydriodide being extremely bulky, the error arising from the space occupied by the precipitate is reduced to a minimum by using a large flask.

	For Berberine. Number of C.c. of $\frac{N}{20}$ KI Consumed by 10 Grammes of the Root.	Berberine Anhydrous.
1	15·1	2·52
2	15·3	2·55
3	14·8	2·47

RESPECTING THE OPIUM ASSAY.

Last year we reported[1] a morphiometric assay of opium, the chief features of which were:

(1) Extraction of the drug by a special method of percolation to separate the morphine.

(2) The volumetric estimation of the extracted morphine by standard iodine. In this method only 1 gramme of opium is taken.

As a result of our further work we now offer some additions to this process of opium assay, as follows:

(1) A more desirable solvent for the extraction of the morphine.

(2) An adaptation to the use of standard acid for those who prefer it instead of iodine, in the volumetric determination of the morphine. This, however, makes it advisory that 3 grammes of opium be taken instead of 1 gramme.

Having additional experience, we present a new statement of the directions for the work, in the accompanying paper entitled "Directions for Certain Alkaloidal Assays." (See AMER. JOUR. PHARM., 1899, p. 462.)

In respect to the deficiencies of ordinary opium assays, the following observations may be made:

(1) In most of the methods there is no proof that the opium is completely exhausted.

(2) It is not proven that the narcotine is fully removed, and the same may be said of the most of other opium alkaloids beside morphine.

(3) The heat of evaporation is liable to affect morphine injuriously, easily oxidizable as it is.

(4) The crystalline precipitation of morphine is not complete, and it is not known exactly how much of it is left in the mother liquor.

(5) Some other matters are carried down with the precipitated morphine and weighed as such.

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[1] *Pharm. Arch.*, 1, p. 121; "A. Ph. A. Proc.," 1898, p. 340; *Jour. Am. Chem. Soc.*, 1898, p. 724.

Three assays of a sample of opium, which by the method of the U.S.P., 1890, was found to contain 14 per cent. of morphine, were carried out by the method described in the accompanying paper. Both the alkalimetric and iodometric methods, agreeing quite well with each other, gave results considerably above those obtained by the U.S.P. method.

Opium Taken in Grammes.	$\frac{N}{20}$ Acid Consumed by 2·5 Grammes Opium.	Grammes of Iodine Consumed by ½ Gramme Opium.	Per Cent. Morphine Found.	
			Alkalimetric.	Iodometric.
1·3	31·1	0·116652	17·66	17·50
2·3	31·5	0·116672	17·90	17·50
3·3	31·3	0·116590	17·78	17·49

HOT EXTRACTION INSTEAD OF COLD PERCOLATION IN THE ASSAY OF OPIUM.[1]

Instead of extracting the morphine from the opium by cold percolation with an alcohol-chloroform mixture as here described, hot extraction with chloroform alone in a suitable extraction apparatus may be used. Though morphine is very slightly soluble in cold chloroform, it dissolves much more easily on the application of heat.

This has been shown by Florio,[2] and verified by us. The most suitable apparatus for this case is undoubtedly that of Dunstan and Short,[3] as it can be used for cold percolation as well as for hot extraction. If this method of extraction be preferred, the opium mixed with the sodium chloride is placed in this apparatus and exhausted by cold percolation with benzol, as described above. A current of dry air is then passed through the tube till the powder becomes dry, which can be seen by the light color that the powder assumes, or by the fact that the tube ceases to feel colder than the surrounding medium, the apparatus then connected with a small round-bottomed flask containing 40 to 50 c.c. of chloroform, and the powder extracted on a water-bath till exhaustion is complete. Care should be taken that only a small surface of the bottom of the flask be heated, and that a layer of solvent be constantly on top of the powder. Most of the chloroform can then be distilled off and

[1] See the section on the hot extraction method as an alternative to cold percolation, in the general process for analytical extraction of drugs in "Directions for Certain Alkaloidal Assays." (AMER. JOUR. PHARM., 1899, p. 462.)

[2] *Gaz. chim. Ital.*, 13, 496.

[3] *Pharm. Jour.* (3), xiii, 664.

the balance evaporated from a shallow vessel. The residue in the evaporating dish and that left in the flask are then taken up with acid (standardized if an alkalimetric assay is intended) and the operation finished as above. If only an iodometric assay is desired, the acid solution is made up to a given volume, shaken with a small quantity of calcium hydrate, and the filtered half of the solution treated with iodine as above. In this case only 1 gramme of opium need be used.

COMPARATIVE MERITS OF IODOMETRIC ESTIMATION.

Of the various devices which have been resorted to in the estimation of alkaloids, two general methods are especially worthy of regard because of their directness and simplicity, namely, the gravimetric method and the alkalimetric method.

The gravimetric method, using chiefly solvents to separate the alkaloid and weigh it uncombined, has the advantage of extreme simplicity of principle, but the disadvantage of depending upon solvents for separation from non-alkaloidal matters, a separation lacking in exactness and requiring repetitions which take up much time. The result is apt to be a compromise between the loss of alkaloid left behind in the solutions and the gain in weight by impurity in the final product.

The alkalimetric method is certainly based upon the best of principles, and so far as it can be readily executed with exactness, it should have the preference. Unfortunately, the combination of alkaloids with acids is not a reaction quickly and sharply defined. The presence of ammonia must be excluded. The end-reaction depends so much upon the choice and quality of the indicator, the personal equation of the operator and the light where the observation is made, that results are often in doubt, or ought to be.

The iodometric method, in the instances of alkaloids which form distinct higher periodides insoluble in excess of the reagent, has claims as follows: It is based upon fixed chemical proportions deduced from analyses of the products of the reaction; the end-reaction is very sharp indeed; the actual exactness of the estimation has been verified, and the volumetric reagents required are among those most commonly in use and of earliest introduction into the pharmacopœias. The estimation is done in an acid solution, and ammonia or other alkali does not interfere.

COMPARISON OF IODOMETRIC AND GRAVIMETRIC RESULTS.

NUX VOMICA.

Drug.		Quantity Taken for Assay. Grammes.	Iodine Consumed.	Percentage of Alkaloids. Iodometric.	Gravimetric.
Iodometric	1	1	0·0526816	2·52	—
	2	1	0·0526725	2·52	—
Gravimetric . . .	1	1	*	—	2·73
	2	1	*	—	2·73
BELLADONNA ROOT.					
Iodometric	1	2·5	0·0459179	0·52	—
	2	2·5	0·0459263	0·52	—
Gravimetric . . .	1	2·5	*	—	0·51
	2	2·5	*	—	0·51
BELLADONNA LEAVES.					
Iodometric	1	5	0·0478286	0·27	—
	2	5	0·0475922	0·27	—
Gravimetric . . .	1	5	*	—	0·28
	2	5	*	—	0·28
IPECAC ROOT.					
Iodometric	1	2	0·0957764	2·61	—
	2	2	0·0986633	2·69	—
Gravimetric . . .	1	2	*	—	2·63
	2	2	*	—	2·62

*Alkaloids shaken out and weighed.

ON THE USE OF "WOOD PULP" SHEETS AS A SUBSTITUTE FOR FLAXSEED MEAL AND OTHER SUBSTANCES IN POULTICES; ALSO, A FEW OTHER USES FOR THE MATERIAL.

By Frederick T. Gordon, U. S. Navy.

As an introduction to an article which I will endeavor to make as practical and comprehensive as possible, I want to say a few words on the sentimental side of the subject. As an "apothecary" in our naval service, the dollars and cents side of the topic touches me very slightly, my interest is professional, but I know that these same dollars and cents are all-important to my confrères in civil life. Therefore, as an individual and also as a member of a little corps for whose benefit the "druggists" have done so much of late, it gives me the greatest possible pleasure to be able to suggest an addition to the ways and means by which our druggist friends may add to their stock of useful articles and to their profits as well.

That I have good reason for believing that there *is* a money side, as well as a professional one, to this new use for wood pulp, is proven to me by the widespread interest my suggestions have aroused. About two weeks ago the *Medical Record* (New York) published a short article of mine on this subject; since then I have received a number of inquiries from both doctors and druggists in all parts of the country as to details, cost, place of manufacture, etc. I plead as an excuse for mentioning this personal matter that it shows conclusively that there is a demand for something to replace flaxseed meal in poultice-making, and that "wood pulp" seems to come very near to the ideal substance. Therefore, I think that the subject is worthy the attention of the druggist. He can procure this material and supply it to his clientele of physicians, as well as to the regular trade.

As regards cost and source of supply of the article I regret that I cannot give much definite information on this point. The firm from whom I procured the sheets with which I experimented is the McDonald Paper Mills, Manayunk, Philadelphia, Pa., and, as far as I can remember, the cost was very nominal. I do know this, that any druggist who is desirous of going into this subject can obtain full information as to cost, etc., from the firm from whom he buys his paper. The sheets of wood pulp can be had in any thickness and in any size if a demand is created for them, as this is a common way in which the wood pulp is shipped from the mills to the paper makers. There are a number of pulp mills in the New England States, Maine especially.

Before I begin my summary of the uses to which the wood pulp sheets can be put, I must emphatically state that the looser the texture of the sheets the better will be the results. A closely pressed sheet will take longer to make use of, and will not be so satisfactory; the crude sheets, just as they come from the mills, are the best. I prefer the so-called "unbleached pulp," since the "sulphite pulp" sometimes contains a trace of sulphites and other bleaching chemicals.

THE USES OF WOOD PULP SHEETS.

As a Substitute for Flaxseed Meal for Making a Poultice.—Cut a sheet of the pulp to a size approximate to the surface to be covered, soak the sheet in *hot* water until it has become thoroughly softened,

then lightly wring it out, very lightly, and apply. The wood pulp sheet will absorb and hold from four to five times its weight of water, and, since heat and moisture are the desiderata in poultices, we have them here in a simple, cleanly form. No cloths are needed, no cooking, no stirring and spreading on cloth, just a soaking in hot water. And the nicest part is the total absence of the mess inevitable to making flaxseed meal poultices, although there is, too, a great economy of time and trouble. I sometimes find it advisable to put a piece of oiled muslin over the sheet to help retain the heat and moisture.

When the "poultice" begins to get cold, take it off, wring out the water and soak it again in hot water, and so on, indefinitely. I have used the same sheet of wood pulp for two days' poulticing, in the hands of an ignorant man at that, my instructions to him being "to soak the plaster in hot water whenever it got cold, and put it on again," and he said it "worked all right." By the way, every physician who has had the annoyance and trouble of being compelled to leave an all-important matter of poulticing to an ignorant person will appreciate a way that will allow of no loophole for mistakes and failures.

Any desired degree of softness can be had by regulating the time of soaking. As a precaution, *be sure and soak the pulp long enough at the start.*

If it is desired to have an antiseptic action in connection with the poulticing, mercuric chloride, carbolic acid, or any water-soluble germicide can be dissolved in the water to the proper strength, and then the drug will penetrate into every portion of the sheet and give you an antiseptic dressing as well as a poultice.

As far as I have experimented, I know of no drug possessing antiseptic properties which is incompatible with wood pulp, as it is almost pure cellulose. To sterilize a dry sheet, place it in an ordinary stove oven and leave it there a few moments; it will not hurt the pulp if it does kill the germs. And, by the way, there is very little germ material in wood pulp; the most omnivorous bacteria can find little to eat in such a substance.

In lieu of a charcoal dressing for foul ulcers and sores, char the surface of a sheet, say to a quarter of an inch, scrape the burnt side lightly, then apply. You will then have a deodorant as well as absorbent dressing.

Wood pulp, when dry, will absorb melted ointments and oils. Therefore, menthol, thymol, carbolic acid or similar substances can be dissolved in the oil or ointment and the sheets of pulp soaked in the mixture, giving a cleanly and convenient way of applying a salve or antiseptic unguent. Any desired degree of impregnation can be had by regulating the amount absorbed by the pulp; if an excess is not used, the sheet will also absorb the discharges from the wound or sore. By scraping the sheet down to a pulpy mass, a substance is obtained which can be used to hold any salve or plaster; this can be moulded to any desired shape, say for vaginal tampons or suppositories. The *dry* mass may be used as a "sponge-tent," too, as pulp is very absorbent.

As a Splint.—Thick sheets of wood pulp, if soaked sufficiently to soften them, can be moulded to fit any limb or surface; when the sheets become dry, they will be found to retain their shape perfectly and to possess a remarkable sustaining power and stiffness.

A thin layer of plaster-of-paris may be sprinkled between two thin sheets, or a thick one split; by moistening the surfaces sufficiently, and applying them while moist, a most excellent plaster support will be had. It can, of course, be shaped in any manner desired, and when it is to be removed, there will be very little of the usual pain and annoyance incidental to the ordinary plaster bandage.

Other Uses.—In case of a shortage of lint or cotton, the physician can scrape down the sheets of wood pulp he carries in his pocket, and, after sterilizing the fluffy mass for a few minutes in his patient's stove, he has a most excellent substitute for the above articles.

As an Ice-cap.—Soak the wood pulp in ice water, mould to shape of head and apply; renew as with hot poultices. This method gives a very light and comfortable ice-cap, which will stay on and not fall off.

In Pneumonia.—A favorite treatment of many physicians for the early stages of pneumonia is to apply a jacket poultice around the chest. Cut the sheets of wood pulp to size, using at least an inch of thickness, soak in hot water until enough is absorbed, apply, cover with oiled muslin to retain heat and to keep clothes dry, keep in place with a few turns of a bandage. As before mentioned, the great advantage of wood pulp lies in its convenience and freedom from "messiness." Any one who has ever made a "jacket poultice" will appreciate this use of pulp.

As regards transportation, a very important topic for physicians in thinly-settled districts, it may be said that the sheets of wood pulp are very light, and quite a quantity can be carried under the buggy seat. When you have *it*, you have cloths, material, apparatus; in fact, everything for poultices except the hot water. The only drawback is its bulk, but one cannot get perfection in every feature.

I have briefly outlined these few of the many uses to which wood pulp can be put. Probably there is not a single druggist who cannot suggest many more and better uses now that his attention is drawn to this material. There are numerous uses to which the pulp can be put in every store and laboratory, as, for filtering cloudy elixirs, wiping up grease and dirt, a non-conducting surface to rest pots and crucibles on, as a cover for a steam heater or condenser, etc.

As a commercial article, permit me to make these suggestions: For the medical profession, keep an assorted supply of the sheets of wood pulp, of course acquainting them with the uses and virtues of the material by actual demonstration. They will be quick to appreciate the cleanliness and convenience of wood pulp as an aid to their practice, and will, no doubt, make much use of it.

THE VALUATION OF VEGETABLE DRUGS AND FOODS.[1]

By Henry Kraemer.

After the identification of a drug or food, the next question to be considered is its quality or value in a commercial sense. While the identification of drugs and foods is universally recognized as being of importance in handling them, yet it is also apparent that commercial success is dependent upon something more than this, *i. e.*, the intrinsic worth or value of the drug or food to the consumer. In times that have passed there was a kind of personal knowledge of drugs and foods which enabled one readily either by reason of appearance, odor, taste or the sense of touch, to pronounce upon the value of them. As to whether our system of education is the cause of men not endeavoring to obtain this "personal knowledge" of drugs and foods, or whether these tests are not

[1] Presented in abstract at the meeting of the American Pharmaceutical Association, September, 1899.

sufficient for the finer determinations of quality, or whether men have not the inclination to follow in the footsteps of their fathers, and patiently acquire this art for testing these products, we cannot say. Probably a combination of all these factors is at work producing the modern analysts.

Mr. Chas. H. La Wall,[1] in a paper on "Pharmacopœial Preparations from an Economical Standpoint," has shown in at least one instance how impracticable it is, financially speaking, for a pharmacist (compared to the manufacturer) to test his chemicals, preparations, etc. It is apparent that the Committees on Revision of the U.S P. and other pharmacopœias appreciate the difficulties which attend the testing of chemicals and drugs purchased by the retail pharmacist, and very wisely have proceeded very slowly in introducing assay methods and tests which, though valuable and necessary to the manufacturer, may be but little, for economic and other reasons, employed by the retail druggist. The question arises: Is it possible for methods to be devised or accepted by the Revision Committee of the U.S.P. which can be employed practically by the pharmacist? Are there any methods for some of the more potent as well as other drugs, which he can employ quickly, or at the most without great expense, which will express to him their value? Is it possible to use smaller quantities and secure quantitative results that are as valuable as when larger amounts of the drug are employed? Are there other methods besides those of chemical assay that may be employed with equally as good results? The writer is of the opinion that a large number of general principles may be laid down and which can be worked out so as to make the subject of the valuation of vegetable drugs practicable, from an economical standpoint, to those who are properly qualified to dispense drugs, etc.

In the identification of drugs or foods certain characteristics are revealed, such as color, odor, appearance or impressions upon the sense of touch which are of more or less qualitative value, indicating care in gathering and storing, preparation for the market, etc. For their quantitative valuation, however, other means that are much more complicated and laborious are employed.

By the quantitative valuation of drugs and foods is ordinarily

[1] AMER. JOUR. PHARM., 1899, p. 64.

understood processes involving chemical assay. The advantages of, and objections to, this mode of the valuation of drugs are too well known for me to treat of them at this time. It must be said, however, that from here and there have come evidences that the valuation of some drugs is best ascertained by other means than by chemical assay. Dr. Squibb has recommended the physiological test for aconite and its preparations. Remington (Practice of Pharmacy, p. 1056) says, under cantharides, that "The most satisfactory test of cantharidin is its vesicating property." Insect powders have by some experimenters been tested by placing a number of insects under the direct influence of the powder. A few years ago the author showed how, in some instances, as in the adulteration of cloves with pimenta, starch, etc., a quantitative microscopical method could be applied.

The question as to what is the quantitative value of vegetable drugs and foods is such an important one that the author has endeavored to broaden its scope, and to bring into co-operation all methods and tests that will in any way assist in the solution of the many problems connected with it.

The methods employed, or which are coming into use, may be conveniently grouped into five distinct classes, viz.:

I. Chemical Methods.
II. Physical Methods.
III. Microscopical Methods.
IV. Biological Methods.
V. Methods involving the use of the Polariscope and Spectroscope.

I. CHEMICAL METHODS.

For reasons which will be apparent later on, the author does not propose to consider the usual chemical assay methods. It may be stated, however, that he is fully aware of the value of the more or less definite and quantitative results which may be had by application of these methods in the examination of drugs. It may, moreover, be said that some of these methods, with the various modifications and improvements, will undoubtedly continue to be employed. The question, nevertheless, suggests itself, cannot general methods be devised which may not only be performed quickly, but which will, compared to a standard, *i. e.*, the best quality of drug, give results which will have a certain commercial significance?

(*A*) It has been the attempt of the author, under these methods, to work upon the least quantity of drug necessary to obtain appreciable reactions or characteristic results. For instance, in looking at the various drugs containing tannin, the question may be asked: "Is it not as satisfactory to take 100 milligrammes (0·100 gramme) of the drug and boil it for a few minutes with 20 c.c. of water and make a colorimetric test on this solution, using ammonio-ferric alum as a reagent, as it would be to make a solution of a larger quantity, and endeavor to obtain values either in terms of permanganate or by the hide method, etc.?" Every one who has worked on the estimation of tannins must appreciate how unsatisfactory are the quantitative estimations as usually carried on.

By boiling the various drugs containing tannin (as quercus alba, geranium, kino, catechu, galla and krameria) with water, in the amounts suggested above and diluting, as necessary, after adding a few drops of a ferric-ammonia-alum solution, solutions are obtained which may be compared in color to a standard of a given strength.

The following are the quantities used of the drugs mentioned above, and the results obtained therewith:

Take 0·100 gramme of quercus alba, boil with 20 c.c. of water; filter, and when cool take 5 c.c. of the solution, dilute with 25 c.c. of water; add ammonio-ferric alum solution, and there is produced a faint greenish-brown color, and in the course of a few hours a precipitate of the same color results.

Take 0·100 gramme of krameria, boil in the same manner with 20 c.c. of water. Filter, and when cool take 5 c.c. of the solution, dilute with 160 c.c. of water; add ammonio-ferric alum solution, and there is produced a grayish-blue color, corresponding in intensity to the coloration produced with quercus alba. It should be noted that a dilution of over six times is necessary to produce the same intensity of color.

Using an analogous procedure with geranium, it is found, if to 5 c.c. of the aqueous solution 180 c.c. are added, that, with a few drops of ammonio-ferric alum solution, a coloration of equal intensity to that of solutions of oak bark or krameria may be secured.

Five c.c. of the original solution of catechu requires to be diluted with 200 c.c. of water in order to produce, with ammonio-ferric alum, a solution of like intensity of color to solutions of the preceding drugs.

Kino requires that 300 c.c. of water be added to the 5 c.c. of solution of the drug to produce a corresponding intensity of color. Galls, on the other hand, require that to 5 c.c. of the original solution as many as 400 c.c. of water be added to obtain, with ammonio-ferric alum, a coloration that is equal in intensity to that of the solutions of the other drugs mentioned.

There is a slight difference in the color of the solutions obtained and a more marked difference in the color of the precipitates. Precipitates of oak bark, with ammonio-ferric alum, have a slightly greenish-brown color; those of geranium and galls have a light pinkish-blue color; those of catechu and kino are more or less grayish-blue or violet; and that of krameria has a slightly deeper gray color.

We find that the amount of water necessary to be added to 5 c.c. of the solution of the drug in order to produce solutions of equal intensity increases with the amount of tannin in the drug, as the following figures indicate:

Drug.	Per Cent. of Tannin. (Approximately.)	Number of C.c of Water be Added to 5 C.c. of Solution of Drug (each C.c. of which has ·005 Gramme o Drug).
Quercus alba	6–11 per cent.	25 c.c.
Krameria	20 "	160 "
Geranium	12–27 "	180 "
Catechu	35 "	200 "
Kino	50 "	300 "
Galls (Aleppo)	50–60 "	400 "

(*B*) Working on a similar basis, it is possible to get relatively approximate values with those drugs that contain oxymethylanthraquinone or some of its derivatives. In this case ·100 gramme of the drug is boiled for a few minutes with a solution containing 5 c.c. KOH $\frac{N}{3}$ + 15 c.c. water. The amount of water that is required to be added to produce a light straw color is noted. In the following table is given a list of substances, the number of cubic centimetres of water required to be added to them to produce colors of nearly equal intensity, and the dose of the drug in grammes:

Drug.	Number of C.c. of Water Required to Produce a Light Straw-colored Solution with ·100 Gramme of Drug + 20 C.c. of KOH Solution.	Dose in Grammes.
Senna (Alexandria) . .	35 c.c.	4–8 grammes.
Senna (Tinnivelly) . .	35 c.c.	4–8 "
Rheum	95 c.c.	0·6–2 "
Frangula	115 c.c.	1–2 "
Rhamnus Purshiana . .	115 c.c.	0·6–4 "
Aloes	295 c.c.	0·20–0·60 "
Aloin (Merck)	395 c.c.	·03–·12 "

The shade of color is not pure yellow, but varies in the different drugs. With the sennas, the color is nearly pure yellow. The solutions of aloin and aloes are somewhat yellowish-green. Those of rheum and cascara sagrada are yellowish-purple. The solutions of frangula are still more purple.

It should be noted that, in comparing the above solutions with a solution of chrysophanic acid, the following proportions give a solution of about the same intensity as the drugs examined. To ·025 gramme of chrysophanic acid add 10 c c. $\frac{N}{3}$ KOH solution + 15 c.c. water. To this solution 240 c.c. of water are added, when there results a light straw-colored liquid, resembling that of frangula rather closely.

It ought to be said, in presenting these results, that the idea has not been to carry the comparisons outside of the same class of drugs. It would appear, however, that it is possible to go even further, as we see in the above table that there is a direct ratio between the doses of the drugs and their colorimetric valuation; or we may say that the larger the dose required, the less the proportion of water necessary to produce a solution of equal intensity to other drugs of its class and *vice versa*.

(*C*) In working with certain other drugs that contain coloring principles, we find that fairly accurate values may be obtained on comparing commercial specimens with material whose value, by reason of experiment or experience, we know something about. If we take,

for instance, ·100 gramme of hæmatoxylon (logwood) and macerate it with 500 c.c. of water for a short time, the solution will assume a very slight purplish color. If we add to this solution a few drops of ammonia water, it becomes a cherry-red. Comparing this colored solution with that of other commercial specimens, differences in intensity are observable, which indicate the comparative value of the samples.

(*D*) In endeavoring to ascertain the value of a sample of crocus, carthamus or calendula, we find that light straw-colored liquids are produced on using 0·100 gramme of any of these drugs and mixing them with certain proportions of water. 0·100 gramme of calendula requires 15 c.c. of water, 0·100 gramme of carthamus requires 100 c.c. of water, and 0·100 gramme of crocus requires 500 c.c. of water to produce solutions of about the same intensity of color. We find, moreover, on taking 0·100 gramme of each of these drugs and mixing it with 10 c.c. of alcohol, that the crocus alone is *immediately* colored, producing a solution the color of which is about equal in intensity to the aqueous solution already described. This is a rather quick method for getting approximate values of the commercial articles. It should be noted, as in the preceding cases (*A*) and (*B*), that the yellow color of the aqueous solutions is not of exactly the same shade with all three of the drugs. The yellow color is purest with crocus. In calendula, there is a slight purplish tint, and in carthamus there is a shade of color between calendula and crocus.

(*E*) The most important field of operation, and one which has the greatest promise in the direction already indicated, is with drugs that contain alkaloids or other active principles with which precipitates or colorimetric reactions may be obtained. Operating with quantities of drug varying from ·100 to 1·00 gramme, it is soon apparent that results are obtainable which may have as great a commercial significance as the results obtained by the more laborious and tedious methods usually followed by analysts and assayers. The number of specimens operated upon has not been as numerous as was desired, but probably sufficient work has been done to justify calling attention to the importance of another line of investigation on this most important subject of the valuation of drugs from a commercial standpoint.

It seems to the author that if the principles of chemical assay

were reduced to their utmost simplicity, and that if the difficulties surrounding this subject from an economical standpoint were removed, few pharmacists would be unable to determine the value of their purchases.

It ought to be said, too, that this line of work suggested itself after several years of labor in endeavoring to secure results by micro-chemical methods upon the drugs themselves. This latter procedure I reluctantly give up for practical reasons for the present. There are so many other substances in the drug foreign to the principle or principles, the reactions of which are to be studied; and these, with microscopic conditions of heat, moisture, etc., cause an unsatisfactory condition of affairs, in that we have the appearance and disappearance of things, regarding the interpretation of which we cannot say anything definite as yet.

The object sought with the class of drugs here considered has been to ascertain the least quantity of drug which could be employed in making solutions which, with characteristic reagents, would give reactions that might have a commercial quantitative significance, and give methods which might be readily applied by the pharmacist. Before the matter is finally solved and put upon a satisfactory basis, a great amount of work must be done by different experimenters and observers upon each of the drugs where procedures as given are possible.

The following are the drugs that have been experimented upon:

(*a*) *Nux Vomica* (assaying 2·25 per cent. of total alkaloids).—0·100 gramme of the powdered drug is mixed with 10 c.c. of a modified Prollius fluid[1] and allowed to stand, with frequent agitation, from four to twenty-four hours. The solution is then filtered into a small separatory funnel and 5 c.c. of a dilute sulphuric acid (0·5 per cent.) added, and after separation of the aqueous solution the latter is diluted with 5 c.c. of water. This solution of 10 c.c. contains 0·00225 gramme of the alkaloids of nux vomica. Calculating 20 drops as being equivalent to 1 c.c., we have 20×10 c.c. $= 200$ drops. Then 200 drops of liquid contain approximately ·00225 gramme of alkaloids and 1 drop contains $\frac{1}{200} \times ·00225 = 00001125$ gramme.

[1] Ether, 60 c.c.; alcohol, 7·5 c.c.; chloroform, 30 c.c.; ammonia, 2·5 c.c. It should be borne in mind in this connection that probably the modified Prollius solution does not extract all the alkaloids in the various drugs equally well.

Two or three drops of this solution on a watch-crystal give with:

(1) Mayer's reagent, a pronounced white precipitate.

(2) $K_2Mn_2O_8 + H_2SO_4$, a purple color that is evanescent.

(3) $K_2Cr_2O_7 + H_2SO_4$, a purple color that is more persistent.

(4) Gold chloride solution gives a very slight yellow precipitate.

(*b*) *Guarana.*—1·000 gramme of the finely powdered guarana is mixed with 10 c.c. of a modified Prollius solution and allowed to macerate from four to twenty-four hours. The solution is then filtered into a small separatory funnel and 5 c.c. of a dilute sulphuric acid (0·5 per cent.) solution are added. The aqueous solution is separated and a few drops of this latter solution containing the alkaloids give, with a tannin solution, a white precipitate which readily dissolves in excess of the reagent. A few drops of the solution, after neutralizing with ammonia, are evaporated nearly to dryness in a watch-crystal on a water-bath. A drop of HCl and a very small crystal (or better, a drop of a weak solution) of $KClO_3$ are added to this residue; this is again evaporated to dryness, and on exposing the dried and cooled residue to the fumes of NH_4OH, a faint opalescent blue color is produced. If, instead of employing HCl and $KClO_3$, as in the previous test, a few drops of bromine are added, the solution evaporated to dryness and the residue exposed to fumes of NH_4OH, a more pronounced bluish opalescent color is produced.

(*c*) *Ipecac* (containing 2·00 per cent. of alkaloids).—One gramme of the powder is mixed with 10 c.c. of a modified Prollius solution and allowed to macerate, with frequent shaking of the bottle containing the mixture, from four to twenty-four hours. The solution is then filtered into a small separatory funnel and 5 c.c. of a dilute sulphuric acid solution (0·5 per cent.) are added. The latter solution containing the alkaloids is separated and 5 c.c. of water are added.

This solution (= 200 minims) contains approximately 0·02 gramme of alkaloids. One minim contains 0·0001 gramme of alkaloids. To a few drops of this solution the following reagents are added and the precipitates noticed:

(1) Mayer's reagent gives a copious yellowish-white precipitate.

(2) $K_2Cr_2O_7$ solution gives a copious pumpkin-yellow precipitate.

(3) Picric acid produces a bright yellow precipitate.

(*d*) *Gelsemium* (containing 0·35 per cent. of alkaloids).—1 000 gramme of the finely powdered gelsemium is mixed with 10 c.c. of a modified Prollius fluid and allowed to macerate for from four to twenty-four hours. The solution is filtered and treated with 5 c.c. of a dilute sulphuric acid and 5 c.c. of water, as in previous experiments. A few drops of this separated solution (1 drop = 0·0000175 gramme alkaloids), containing the alkaloids, are treated with the following reagents, causing the reactions noted:

(1) Mayer's reagent produces an immediate yellow precipitate.

(2) Ammonium molybdate produces a blue-colored solution which becomes more marked in a few minutes and the color may last for a number of hours.

(3) Picric acid produces a slight yellowish precipitate.

(4) KI + I solution gives an orange-brown colored precipitate.

(*e*) *Opium* (containing 15 per cent. of morphine).—0·100 gramme of powdered opium is mixed with about 3 to 5 c.c. of a modified Prollius fluid; filtered and treated with 5 c.c. of a dilute sulphuric acid solution, as in the other drugs mentioned. The solution is nearly neutralized with 5 c.c. ammonia water (dil.). A few drops of this solution (1 drop = ·000075 gramme of morphine) give with (1) KI + I solution, a brownish-orange-colored precipitate, and with (2) Mayer's reagent, a yellow precipitate. (3) If a few drops of the solution are evaporated to dryness on a water-bath, and then a drop of HNO_3 added, a deep brownish-red color is produced.

(*f*) *Belladonnæ Folia* (containing 0·40 per cent. of alkaloids).—One gramme of the powdered belladonna leaves is digested with 10 c.c. of a modified Prollius fluid, as in the other drugs already mentioned; the solution filtered and mixed with 5 c.c. of a dilute sulphuric acid solution and 5 c.c. of H_2O. The latter solution (1 drop = ·000020 gramme of alkaloids) containing the alkaloids is separated and a few drops are mixed on a watch-crystal with the following reagents, which give characteristic alkaloidal precipitates: (1) Mayer's reagent produces a pronounced whitish precipitate; (2) tannin solution gives a slight yellowish precipitate; (3) KI + I solution gives at first an orange-brown precipitate, which soon changes to a greenish color.

(*g*) *Strophanthus*.—One gramme of ground strophanthus is mixed with 10 c.c. of a modified Prollius fluid, and after maceration from four to twenty-four hours with frequent agitation, filtered into a

separating funnel. To the filtered liquid 5 c.c. of a dilute H_2SO_4 (0·5 per cent.) solution are added. The aqueous solution containing the alkaloids is separated. If this solution does not clear rapidly another portion of ether, after its separation, may be added, when the remaining oil is removed. (1) A drop of this solution is placed on a watch-crystal with a drop of dilute ammonia water and then evaporated on a water-bath, giving a residue which is colored green immediately with H_2SO_4. The green color is soon replaced by a brown coloration. Using two drops of the alkaloidal solution instead of one, a more marked and permanent green coloration is produced with H_2SO_4 (2) Mayer's reagent produces a slight white precipitate with a drop of the solution containing the alkaloid. (3) Tannin solution also gives readily a slight yellow precipitate. (4) I + KI solution produces an orange-brown precipitate.

(*h*) *Cinchona Flava* (containing 7 per cent. of total alkaloids, of which 3 per cent. is quinine).—One gramme of the powder is macerated over night with 10 c.c. of a modified Prollius solution. The solution is filtered into a small separating funnel and 5 c.c. of a dilute H_2SO_4 (0·5 per cent.) solution are added. After agitation and allowing to stand until the two liquids separate, the aqueous solution containing the alkaloids is separated. This solution, which is slightly fluorescent, is rendered neutral with dilute ammonia water, and one drop contains about 0·00015 gramme of quinine. (1) One drop of this solution is mixed with nine drops of water, and upon the addition of a drop of bromine water, followed by an excess of NH_4OH the thalleioquin reaction readily takes place. (2) If one drop of the neutral solution be mixed with four drops of water and a drop of bromine water, followed by a drop of a solution of ferrocyanide of potassium, and then an excess of NH_4OH, a red coloration is immediately produced, which disappears shortly.

II. PHYSICAL TESTS.

There are certain physical tests which are no doubt of considerable value and which may be readily applied with very little cost.

(*A*) In examining the galls (Aleppo) upon the market one finds a varying number from which the insect has emerged and others in which the grub or winged insect varies in the degree of development. In all of the cases where we have galls with a more or less empty central chamber, we find that they are rather light and not so

rich in tannin as those not so affected. A rather careful examination of the better grades of commercial specimens of galls discloses the fact that in from 5 to 7 per cent. of the galls the insect has emerged as indicated by the perforation. Upon opening the remaining 93 to 95 per cent. of galls, it is found that not more than from 10 to 12 per cent. are hollow and contain the large grubs or young winged insects. The remainder should be nearly solid throughout, and the appearance should be more or less grayish and crystalline, or at the most light yellowish and resinous in appearance. Galls answering to these characters will assay 50–60 per cent. of tannin.

(*B*) The specific gravity of at least some drugs has seemed to the author deserving of consideration in ascertaining their commercial value. Last year I was fortunate in setting a student of the Philadelphia College of Pharmacy, Alfred Heineberg, at work in determining the amount of resin in both resinous and starchy tubers of jalap, and also in determining, among other things, the difference in specific gravity of the two kinds of tubers. The results of this work showed that the starchy tubers contained but 1·76 per cent. of resin and had an average specific gravity of 1·194. The resinous tubers of jalap assayed 6·62 per cent. of resin and showed a specific gravity of 1·360, and thus it was demonstrated that, in addition to the appearance of tubers of jalap, a quick method for determining the value of them lies in taking their specific gravity.[1]

This was subsequently found not to be a new idea in getting at the valuation of tubers of jalap. H. Hager ("Proc. A. Ph. A.," 1893, p. 120) prepares a solution of common salt (having a specific gravity of 1·140 to 1·142) by dissolving 200 grammes of table salt in 1,055 grammes of water. The mixture is brought to a temperature of about 15°–17° C., and about fifty tubers are then immersed in this liquid. Not less than forty-five out of fifty tubers should sink in the liquid, and all that do not sink should be rejected, since good tubers have a specific gravity between 1·150 and 1·180. After examination, the tubers are put into a sieve, washed off with water and dried with a linen cloth. Dr. Hager furthermore thinks that the specific gravity of the salt solution might be increased to 1·150. It is rather interesting that the results of experiments carried on by Mr. Heineberg and those of Dr. Hager should so closely agree.

[1] The tubers should be broken in pieces before taking their specific gravity.

The method of Hager is a simple one and deserving of attention from a practical standpoint, as chemical assays of a lot of jalap tubers represent the values of but a few tubers, unless the whole lot is in a ground or powdered condition.

(*C*) The author has been desirous of applying this method of examination to rhubarb and inula, taraxacum and a number of other inulin-containing drugs, but want of time has prevented this work being done.

(*D*) *Absorbent Cotton.*—"In addition to the ordinary test applied to determine the value of absorbent cotton, it has been proposed (*Schweiz. Woch. Pharm.*, 1899, 20) to test its elasticity by observing the weight required to compress a given weight of cotton into a definite space. A comparison has proven that the lower grades of absorbent cotton made from the sweepings, etc., have much less resiliency than has that of good quality made from the high-grade American cotton."

Equally important, however, is the measure of the length of fibres and the determination of the amount of oil adhering to them. For the latter test the cotton fibres are mounted in a saturated chloral solution, when the oil globules adhering to the fibres are manifested in the mount.

(*E*) The gelatinization test given by the U.S.P. under chondrus is worthy also of an extended application to all drugs containing gums or mucilages. The writer finds that the purity of powdered acacia may be readily ascertained on mixing 0·500 gramme of the powder with about 17 minims of water at about 30° C., when, if the acacia is pure, there will be produced shortly a clear mucilaginous mass. With dextrins, or a gum arabic containing dextrin, the resulting mass is either cloudy or less cohesive, or both.

III. MICROSCOPICAL METHODS.

The microscope may ofttimes be utilized when other methods of valuation fail. The microscope is an important adjunct in determining the percentage value of certain foods and drugs, as in the cereals, spices, etc., when starchy materials are used to adulterate them. It does not appear necessary to dwell upon this work here, the author deeming it sufficient to refer to his previous communications on this subject as published in the "Proceedings of the A. Ph. A.," and in the AMERICAN JOURNAL OF PHARMACY, and

also to a recent paper on "The Examination of Commercial Flour," in the *Jour. Amer. Chem. Soc.*, August, 1899.

It ought to be mentioned, however, that this is a subject which, as shown by recent communications in this country as well as abroad, is receiving more and more attention (see *Pharm. Review*, Feb., 1899). Microscopical methods for the quantitative valuation of drugs may be divided into those (1) where no reagents are employed and (2) in which micro-chemical reactions are necessary.

Under Class I may be mentioned: (*a*) the determination of a foreign starchy adulterant in a drug; (*b*) the number of secretion cells, hairs or reservoirs containing oils, resins and other principles, as in rhizomes and leaves, etc., containing these products; (*c*) in determining the number of sclerenchymatic cells or fibres or other characteristic cells of an adulterant or admixture in a drug or food. This is particularly applicable in the study of the spices, some foods, as tea, coffee, cocoa, as well as in drugs.

No doubt upon further examination a very important relationship will be shown to exist between certain cell-contents and the active principles in drugs. It appears, from the further investigations by Mr. Heineberg, that there is a ratio in jalap between the percentage of resin and the number of starch grains and crystals of calcium oxalate. The following table gives the average number of crystals and starch grains found in a mount of 1 milligramme of powdered jalap. The per cent. of resin and specific gravity of the tubers in each lot had also been determined.

Sample.	Per Cent. of Resin.	Specific Gravity.	Crystals of Calcium Oxalate in 1 Milligramme.	Starch Grains in 1 Milligramme.
1	1·76	1·194	88	357
2	6·62	1·360	125	140
3	7·64	1·297	107	178

From these results it would appear that the microscopical method for determining the value of jalap would be as valuable as the method of specific gravity.

Probably the most important class of substances that require a microscopical examination in order to determine their value are the "compound powders," as pulvis glycyrrhizæ compositus,

pulv. sarsaparillæ comp., and others for making fluid extracts and other pharmacopœial preparations. I recently met with a rather interesting case, which is worthy of mentioning here. In examining some compound licorice powder, which had been in a container on a shelf for about nine months, I found that there was an uneven distribution of the different substances that entered into it. I have reason to believe that they were originally well mixed, but that, upon standing in a building in a large city where traffic of teams, etc., in the streets was continuous, causing vibrations or jarring, there was a fractional precipitation of the different substances entering into the powder, those which were heavier or smaller in size manifesting a tendency to form a lower strata, and those tissues that were more fibrous and lighter remaining nearer the surface. This serves to indicate the importance of examining the compound powders that may be purchased and also of shaking up the powders in the containers before using them.

(2) The use of the microscope, where micro-chemical reactions are to be employed, will, no doubt, be somewhat limited in the immediate future, owing to certain difficulties in technique in the work. There are a number of drugs, however, in which important data may be obtained by this means, as nux vomica, strophanthus, hydrastis, spigelia, crocus, etc.

(*a*) When *nux vomica* is sectioned and treated with a sulphuric acid solution containing K_2CrO_7 or cerium hydroxide, a rose-colored reaction appears in the endosperm cells which contain the strychnine. The reaction is rather a slow one, owing to the thickness of the cell walls of the endosperm.

(*b*) *Strophanthus Seeds.*—Sections of the seed are put into concentrated H_2SO_4 (C. P.). Those containing strophanthin give a green color, apparently in the endosperm layer. It must be said, however, that in seeds in which some of the sugar compounds are present, there results, with the albuminoids and nitrogen-containing compounds and the H_2SO_4, a rose or red or reddish-brown color. These color reactions sometimes obscure the green of the strophanthin.

(*c*) *Hydrastis.*—Sections of the rhizome, when put into concentrated H_2SO_4 (C. P.), give in the course of a few minutes a number of needle-shaped crystals of the alkaloids. These increase in number and size as the walls dissolve, and in the course of half an hour the mount is filled with yellow microscopic crystals.

(*d*) *Spigelia* may be readily distinguished from *Phlox carolina* by the fact that the numerous cells in the cortex of the latter contain crystals of calcium carbonate. The proportion of phlox in the spigelia may be determined by testing a sampling of the drug which contains say about ten pieces of rhizome. If two of these give the micro-chemical reactions for calcium carbonate, then the amount of adulterant may be set down as being probably 20 to 25 per cent.

(*e*) *Crocus.*—In determining the value of a sample of crocus, one of the quickest ways is to sample the drug and take from 10 to 100 pieces and put them one by one on a slide containing concentrated H_2SO_4 (C. P.). The number which are colored blue in proportion to the others which are not colored blue represents the percentage of stigmas of crocus in the drug.

The following are the results of an examination of this kind made by Mr. William S. Weakley, a recent graduate of the Philadelphia College of Pharmacy, upon nine samples of commercial saffron:

SAMPLES.	Number of Fragments Colored Blue by H_2SO_4.	Number Not Colored Blue with H_2SO_4.
1	90	10
2	68	32
3	86	14
4	78	22
5	82	18
6	—	26
7	88	12
8	48	52
9	46	54

(*f*) The study of micro-chemical reactions for alkaloids other than those already enumerated is attended with so much uncertainty that it cannot be said that they can be employed with any degree of satisfaction in the determination of quantitative values. I deem it far more expeditious in most cases, as in conium, cinchona, guarana, cloves, illicium, colchici cormis, opium, cocculus, oleum rosæ, amyg-

dala amara, stramonii semen, etc., to exhaust small quantities of the drug with suitable solvents. Then in some cases the active principles are removed from these solutions by shaking out with water. Upon these aqueous solutions tests are then made with various reagents, the precipitates of which may be further examined microscopically. H. Behrens, in his "Anleitung zur Mikrochemischen Analyse," has shown that rather delicate separations may be effected by the different alkaloids in drugs. These separations, however, must be effected upon solutions of the alkaloids of the drugs, rather than upon the drugs themselves. This is a most interesting field for future work, and is one teeming with great possibilities. One of the recent papers on this subject is that by Zenetti (*Pharm. Zeit.*, XLII, p. 752), in which he has endeavored to differentiate the alkaloids by reason of the differences in crystalline structure of the precipitates obtained, these being examined by means of a microscope. His results are summed up as follows: *Strychnine* yields feathery crystals twisted into a sickle shape, sometimes into corkscrew-like combinations. *Brucine*, after two or more days, shows numerously branched formations, with small, shingled rods inserted at right angles on each branch. *Atropine* yields, after a day, numerously branched structures, the tips of the branches consisting of right-angled, thin, smooth plates, with smaller similar plates adherent. *Cocaine* gives rise in a day to the formation of glittering, golden tufts, consisting of acutely pointed needles. *Nicotine* yields a precipitate which almost invariably takes the form of small, sparsely branched rosettes, composed of rigid, unbranched arms, which frequently terminate in a point or long bristle.

(*To be continued.*)

MAGNESIUM CITRATE, EFFERVESCING, ADULTERATED WITH MAGNESIUM SULPHATE.

By Lyman F. Kebler.

Recently the writer was given a sample of magnesium citrate, effervescing, with the information that the article was offered so cheaply that its purity must certainly be called into question. Physically, the article was good. A cursory examination indicated a large excess of sulphate, which, on estimation, amounted to 24·67 per cent., calculated as magnesium sulphate.

The presence of tartaric acid was also suspected, and, on submitting the article to the test outlined by the U.S.P. for detecting this acid, its presence was indicated. But a microscopical examination of the small crystals, which were supposed to be potassium acid tartrate, showed that the crystalline structure did not correspond to that of potassium bitartrate. Further examination proved the precipitate to be potassium sulphate. Potassium sulphate being moderately insoluble in water, the addition of potassium acetate to a saturated solution of the effervescing salt, containing an abundance of sulphate, naturally favored the production of the above chemical. The pharmacopœial test for tartaric acid cannot, therefore, be applied to effervescing magnesium citrate containing much sulphate.

RECENT LITERATURE RELATING TO PHARMACY.

A STUDY OF ALOIN.

The work of Tschirch and Pederson, in tracing the analogy of aloin to the oxy-methyl-anthraquinones, received confirmation in an investigation reported by O. A. Oesterle (*Arch. der Pharm.*, 1899, 81). He mixed an alcoholic solution of aloin (which had been freed from emodin by ether extraction) with concentrated aqueous hydrochloric acid and heated mixture from eighteen to twenty-four hours on a water-bath in a flask with return condenser. After standing some weeks, a crystalline substance, giving that cherry coloration so characteristic of the natural oxymethyl anthraquinones, separated from this mixture.

The crude product, purified by sublimation, or, better, by crystallization from toluol, after decolorizing with animal charcoal, melted at 232°–233° C., and corresponded on analysis to the formula $C_{15}H_{10}O_5$.

An acetyl derivative was prepared by boiling an hour with acetic anhydride and sodium acetate, and analysis of the purified product, which melted at 177°–178°C., indicated a di-acetyl body of formula $C_{15}H_8(C_2H_3O)_2O_5$. The three emodins from frangula, rhubarb and aloes, respectively, show the formula $C_{15}H_{10}O_5$, and of these, aloe-emodin melts most nearly the new product. To confirm identity, the writer prepared the acetyl derivative of aloe-emodin, and found it the same as that obtained above, hence he decides that hy-

drochloric acid converts aloin into aloe-emodin and not into rottlerin as Rochleder thought.

Hydrolysis of aloin was next tried, but no sugar resulted, thus contradicting Kosman's statement that aloin was a glucoside.

The oxidation products of aloin were next studied, and results obtained were not in accordance with Tilden's investigations. The latter obtained, on oxidation with chromic acid mixture, a body melting at 260°–265° C., which he called aloxanthin, and which he supposed was tetraoxymethyl anthraquinone, $C_{15}H_{10}O_6$. Oesterle, by same method, obtained a product melting at 223°–224° C., the analysis of which approximated $C_{15}H_8O_5$. This body he called alochrysin.

H. V. A.

ETHER INHALATION.

Rushmore (*Annals of Surgery*, October, 1898) has found that the dangers and disagreeable symptoms resulting from ether-inhalation may be materially diminished, if not altogether abolished, by careful preparation of the patient and careful administration of the anesthetic. Six minims of Magendie's solution, with atropine sulphate, gr. $\frac{1}{120}$, are injected hypodermically, as a routine procedure from half an hour to an hour before the anesthetization. The advantages of this treatment are pronounced. The morphine quiets the nervous system, renders the patient more susceptible to the ether, less of which will thus be required, and insures a more quiet recovery from the anesthetic; furthermore, it lessens the disposition to nausea and forestalls pain that the patient might otherwise suffer. The atropine limits the amount of secretion from the bronchi, larynx and pharynx, stimulates the heart, prevents undue leakage from the skin and thereby lessens or prevents shock. With regard to the method of administration, the so-called open method is much to be preferred. If the ether is administered drop by drop, not more than 7 minutes, on an average, are required to induce complete anesthesia, and but 3 or 4 ounces will be necessary for the entire operation. With this mode of administration ether may be safely used in pulmonary, cardiac or renal diseases, without undue risk. Less than 10 per cent. of cases personally so treated by Rushmore were troubled with nausea, and these only to a slight degree.—*Phila. Med. Jour.*, 1898, p. 1059.

J. L. D. M.

NEUTRAL SODIUM PHOSPHATE.

Having frequently received orders for pure neutral sodium phosphate, Mr. Brunner decided to prepare such an article, if possible. The purest article available was dissolved in water and phosphoric acid added until a decided acid reaction to litmus was obtained. On concentrating and crystallizing from this acid solution, the crystals gave a red coloration with phenolphtalein. From this it would seem that the preparation of a neutral sodium phosphate is apparently impractical. 1898, *Ztschr. anal. Chem.*, 37, 740.

L. F. K.

SOLANINE IN POTATOES.

Sound potatoes of the crops of 1897 and 1898 were boiled, peeled and the solanine extracted by the method of G. Meyer (*Arch. f. Path. und Pharm.*, *119*, 361), and there was obtained, respectively, 0·02 and 0·026 of a gramme per kilogramme. Selenium-sulphuric acid gave a fine red coloration on warming, and phosphomolybdate produced a yellow precipitate. A very reliable reaction for solanine is a solution of telluric acid in dilute sulphuric acid. This gives an intense raspberry-red coloration when warmed on the water-bath. This color lasts from two to three hours, and is not given by the more common alkaloids, such as atropine, morphine, quinine, etc.—Dr. Bauer, 1899, *Ztschr. f. angewand. Chem.*, *No. 5*, 99.

L. F. K.

DIGESTIVE FERMENTS OR ENZYMS.

Dr. H. Leffmann, in the *Jour. of Franklin Inst.*, *147*, *97* (1899), reports some very interesting results on the interfering reaction of certain food preservatives, especially on starch digestion. The experiments were conducted under uniform conditions, as far as was possible by laboratory methods. A 10 per cent. arrow-root starch solution was made fresh daily and employed in all investigations.

The enzyms employed were malt diastase, taka-diastase, pancreatic extract, peptenzym, a preparation containing all of the enzyms of the alimentary tract and carase, the pawpaw enzym, sold under the trade name "Caroid." Pepsin and the pineapple ferment were also experimented with, but the results were not considered worth reporting.

The antiseptics used were saccharine, β-naphthol, formalin, artifi-

cial and natural benzoic acids, artificial sodium benzoate, boroglyceride, salicylic acid, boric, citric and tartaric acids, sodium carbonate, borax, sodium fluorid, sodium silicofluorid and a mixture of borax and boric acid. From his observations, the author is of the opinion that if the use of any preservatives is to be permitted in food, sodium benzoate and boric acid are the least objectionable, since they appear to have the least tendency to disturb the digestive functions. L. F. K.

EDITORIAL.

THE PRODUCTION AND CULTIVATION OF CAMPHOR.

In 1890 Prof. John M. Maisch called attention to the attempts on the cultivation of the camphor tree in Florida and exhibited specimens at one of the Pharmaceutical Meetings of the Philadelphia College of Pharmacy of the crude camphor obtained from trees grown there (this JOURNAL, 1890, p. 565, 592). A few years ago Lyster H. Dewey prepared a paper on the camphor tree (this JOURNAL, 1897, p. 507), and showed that experiments were being conducted in this country to cultivate the camphor tree, and that it had been grown successfully out of doors as far north as Charleston and Summerville, S. C.; Augusta, Ga., and Oakland, Cal. The article is a valuable one, and while he does not enter into the difficulties connected with the subject (*i. e.*, in getting cheap enough labor, etc.), yet indicates the possibilities of an important industry of this kind by reason of the fact that, while in recent years the importations of camphor are decreasing, the price is steadily increasing.

In an article on "The Production of Camphor in China," Augustine Henry (*Pharm. Jour.*, 1897, March 6; AMER. JOUR. PHARM., 1897, p. 259) said that, while the production of camphor on the mainland of China was an affair of only the last few years, at Kwangsi it promises to develop into an important industry.

There are a number of people, particularly in the Old World, who are considering the possibilities of producing camphor from cultivated plants, and it may interest the readers of this JOURNAL to know the present outlook on the production and cultivation of camphor. We give an excerpt on this subject from the *Kew Bulletin*, 1899, p. 65:

"PRODUCTION IN FORMOSA.

"The following is extracted from the Foreign Office Report on Trade in Japan for 1897 (Misc. Series, 440, pp. 71-72):

"The trade in camphor will probably undergo some modification. Camphor trees are not found in that part of the island (of Formosa) occupied by Chinese settlers. They occur only in the country of the aborigines, or upon the immediate border, and up to the present time the destruction of trees has been carried on in the most wasteful manner. The mode of obtaining supplies of camphor was for foreign merchants, through Chinese agents, to advance money to the savage chiefs for permission to cut down trees. The stills were erected at the expense of the foreigners, who paid a tax of $8 a still to the Chinese

authorities, and a local tax of $10 on each picul (133 pounds) of camphor produced. When the island was ceded to the Japanese, the privileges which foreigners had enjoyed under Chinese rule, of having these camphor establishments in the interior, seemed likely to be withdrawn by the Japanese Government. The Chinese treaty, much more than the Japanese, gives freedom of travel and trade to the foreigner; and if the limitations imposed by our treaty with Japan had been strictly enforced in Formosa, foreigners would have had to retire to the treaty ports. They would have been debarred from distilling or purchasing camphor in the interior, and they would have suffered heavy losses in abandoning the capital already sunk there. Considering that the present treaty had only two more years to run, the Japanese Government has consented to let matters remain *in statu quo;* and when under the new treaty, foreigners obtain a right to settle anywhere in the interior, they will be able to distil as much as they like. But there is also a probability that the preparation of camphor will be made a Government monopoly. With the Formosan supply under its control the Japanese Government could almost secure a monopoly of the camphor trade, for Japan and Formosa are almost the only sources of supply; and advantage may be taken of this to put Formosa's finances on a satisfactory basis. The lands where the camphor trees grow are not privately owned, as is the best portion of Formosa's fertile plains, so the Government could appropriate the camphor-producing districts without interfering with vested interests.

"The following further information is given in the Report on the Trade of Tainan for 1897 (Foreign Office Annual, 2149, pp. 5–6):

"The camphor trade has, so far as concerns foreign merchants in South Formosa, almost entirely stopped, owing, among other causes, to the disturbed state of the country and the difficulty and danger of sending money into the camphor districts. The roads continued throughout the year to be infested with armed robbers, who, on the approach of the military or police, fled to the hills (where it was, apparently, impossible to pursue them), only to reappear at the first favorable opportunity. Robberies became of such frequent occurrence that no foreign or native merchant would venture to send money into the interior. The Japanese authorities, on their part, did not see their way to allow the tax to be paid in the treaty port on arrival of the camphor, and business was consequently brought to a standstill.

"In the raids and skirmishes, too, which have taken place in the camphor-producing districts, numbers of stills have been destroyed. Their destruction was, perhaps, inevitable, but as they were almost entirely erected with money advanced or loaned by foreign merchants in South Formosa, the losses incurred by the latter have been very considerable. It is estimated that not one-third of the stills in existence two years ago, in which foreigners in South Formosa are interested, are now available for camphor production.

"The hope expressed by Her Majesty's Consul in last year's report, that the camphor trade might revive and assume large proportions, has not been realized; in fact, far from this being the case, the camphor export business, as far as South Formosa is concerned, has now (April, 1898) almost stopped.

"These remarks, of course, apply exclusively to the export of camphor by foreign merchants in this district (South Formosa) who have in the past invested considerable sums of money in the business. The production of cam-

phor in the districts of Rinkipo and Shu Shu (Hunliu and Chip Chip), the principal districts whence the drug came to South Formosa, still, I am informed, continues, though to nothing like the same extent as formerly; but all the camphor so produced finds its way via the port of Rokko (Lokkang) to Tamsui, whence it is shipped to Hong Kong and Japan. The roads north of Rokko are said to be perfectly safe, so that dealers can reach the neighborhood of Chip Chip and buy up any camphor that, under other circumstances, should and would go to the foreign firms in Tainan, with whose money the business was first started. Things may remedy themselves in course of time, but the outlook at present is certainly not very bright.

"The following table shows the export of camphor from this port since, practically, the commencement of the trade:

YEARS.	Number of Boxes Exported.
1892	4,315
1893	6,691
1894	12,157
1895	10,145
1896	8,001
1897	3,057

NOTE.—One box contains about 1 picul (133⅓ pounds) of camphor.

"PRODUCTION IN CEYLON.

"The cultivation of the camphor tree has attracted some attention in Ceylon. But, as will be seen from the following correspondence which has appeared in the *Ceylon Observer*, both it and the production of the drug are in the experimental stage.

"SUPERINTENDENT, HAKGALA BOTANIC GARDENS, TO EDITOR 'CEYLON OBSERVER.'

"BOTANIC GARDENS, HAKGALA, April 6, 1898.

"DEAR SIR:—Referring to your question as to what is being done with camphor cultivation in Ceylon, I may add the following to what I wrote you on the 11th of February last. Wishing to satisfy myself that solid camphor exists in the leaves and twigs of even very young plants, I sent a small bundle of prunings, from plants planted out at the end of 1895, to Mr. S. A. Owen, of Messrs. W. Jordan & Co., of Lindula, who had very kindly undertaken to make the experiment for me. I am pleased to state that he has been very successful in extracting solid camphor from them; and as this is of general interest to planters, I shall be much obliged if you will be good enough to publish Mr. Owen's letter in an early issue of your paper.

"The prunings from an average plant 28 months old, as grown here, weigh from 10 to 12 pounds.

"I have a good many plants that want pruning, and if applied to before the end of this month, April, I shall be very glad to supply 10 or 20 or 35 pounds prunings to any person wishing to make the experiment for himself.

"I am, etc., "W. NOCK.

"MR. S. A. OWEN TO SUPERINTENDENT, HAKGALA BOTANIC GARDENS.

"TALAWAKELE, March 30, 1898.

"DEAR MR. NOCK:—Thanks for the parcel of camphor prunings duly received. I have made several experiments. The following is the account of method employed and results:

* * * * *

"A gallon iron kettle was packed with 1½ pounds of leaves and small twigs, together with about 2 pints of water. The cover of the kettle was luted on and the spout fitted with a cork, while a long glass tube proceeded from the cork to a condenser. Applied heat gradually, and kept it up for five hours. At the end of this time the sides of the condenser were coated with camphor, and small lumps were floating in the water which distilled over. All the camphor was collected carefully and dried between bibulous paper (to absorb most of the adhering oil). It then weighed 55 grains, which is equivalent to 12 ounces to the hundredweight, or 15 pounds to the ton.

"I think the results very encouraging, as the leaves and young parts of the camphor tree contain but a very small proportion of camphor compared with the trunk-wood. Indeed, I believe that in Formosa and other camphor-producing countries it is customary to altogether discard the branches and leaves and use the main-wood only.

"I should think that planters who have young camphor trees coming on here in Ceylon would find it well worth their while to utilize their prunings—especially if fire-wood is available and cheap, as this latter item would be practically the only expense, beyond the small amount of labor required and the initial expense of a still, which latter could be easily extemporized out of almost any kind of large iron vessel to which heat could be applied. As the camphor tree is a long while coming to maturity, considerations of this kind ought to be borne in mind.

"I have pleasure in enclosing a small sample of the camphor obtained. As you will see, it has a rather dirty appearance, due to unavoidable impurity, and the sample smells of camphor oil, but these are easily got rid of in the process of refinement. I also enclose a small sample of the same camphor partly purified by sublimation.

"You are, of course, very welcome to make what use you like of this account of these small experiments, whether by publication or otherwise. No doubt it would be encouraging to those who have gone to the expense of planting up camphor trees to know that there is camphor in our locally-grown trees. I have heard of one or two misgivings as to whether the soil and climate here would favor the formation of camphor in the tree.

"Yours faithfully,

[Signed] "S. A. OWEN."

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

THE DISPENSATORY OF THE UNITED STATES OF AMERICA. By Dr. George B. Wood and Dr. Franklin Bache. Eighteenth Edition. Thoroughly revised and largely rewritten. With illustrations. By H. C. Wood, M.D., LL.D.; Joseph P. Remington, Ph.M., F.C.S., and Samuel P. Sadtler, Ph.D., F.C.S. Philadelphia: J. B. Lippincott Company. August, 1899.

This work, so well known and so much appreciated by the medical and pharmaceutical professions for nearly three-quarters of a century, has now been revised for the seventeenth time. While we recognize the remarkable advances in the sciences since 1833, when the first edition of the United States Dispensatory was first published, it must be further apparent that there have been equally as rapid advances during the past few years. The editors of this Dispensatory truly say that, since the publication of the seventeenth edition, "at no period has there been so much activity in the field of Materia Medica and Therapeutics as during these five years." Recognizing the numerous additions to our knowledge, they have, in about a year after the edition of the new British Pharmacopœia, produced a work which, with its comments upon this standard, as well as the revision of old matter and introduction of new material, is very welcome to the professions requiring this book for daily use. "The most laborious work of the editors has been in the consideration of synthetic remedies, and excepting in regard to the British Pharmacopœia, the greatest amount of change will be found in Section II, Part II, of the present volume, which treats of new drugs, nearly 200 articles having been written for this portion of the book."

That an attempt has been made to bring the work up to recent date is shown in almost all the articles considered. For instance, under assay processes of the potent drugs the recent improvements are given, together with copious references to literature. We find, further, that in the preparation and testing of the various pharmaceutical preparations the more recent experiments and criticisms are incorporated. That portion of the work treating of the various constituents of plants has been well brought up to date. The portion on the newer synthetic remedies and drugs is of particular interest to the professions, as it represents the latest and most authoritative information on those drugs which are likely to have a more or less permanent place in the materia medica. The nomenclature of the botanical portion of the book has been gone over and brought in accord with the views of modern systematists. Many new facts regarding the toxicology, medical properties and uses of drugs and their preparations are given.

Taking the work as a whole, it can be safely said that the work of revision and rewriting has been credibly done, and that the members of the professions of medicine and pharmacy will find in the present edition a work which continues to be invaluable as a "time saver" in getting at the most recent information on all subjects pertaining to the origin, habitat, physical, chemical and medical properties, pharmacy, adulteration, uses, toxicology and modes of administration of all the drugs and preparations which are employed at the present day.

A LABORATORY MANUAL OF PHYSIOLOGICAL CHEMISTRY. By Elbert W. Rockwood, B.S., M.D., Professor of Chemistry and Toxicology in the University of Iowa. Illustrated with one colored plate and three plates of microscopic preparations. 5⅜ x 7¼ inches. Pages viii–204. Extra cloth, $1, net. Philadelphia: The F. A. Davis Company.

The author being firmly convinced of the superiority of the laboratory method of instruction over the didactic, in enabling the student to become familiar with the physiological changes in progress in the animal body and

the products resulting therefrom, has written this work, giving experiments and directions for carrying on work in physiological chemistry. The following subjects are treated: carbohydrates, fats, proteins, fermentation, saliva, gastric juice, pancreatic juice, blood, bile, bone, muscular tissue, milk, urine, urinary sediments, systematic testing of urine, urinary calculi, the metric system, and composition of reagents.

The work has been arranged for a course of one year in a medical school, but a careful perusal of the work indicates that there is much information here for pharmacists. Many of the experiments—in fact, all of them—if properly carried out, would enable the pharmacist to carry on much of the work that he has to do for the physician more intelligently and profitably. The parts of the book treating of urine, urinary sediments, systematic testing of the urine, blood and ferments will be found particularly valuable to pharmacists who are alive to the professional possibilities and opportunities of their calling.

ANNUAL REPORT ON THE YEAR 1898. Darmstadt: E. Merck. Published in March, 1899.

In addition to the report on the subjects in medical chemistry, microscopical technique and the nutrition of patients, which have gained importance during the year 1898, this little work contains a valuable original communication upon the "Physiological and Therapeutical Investigations on the Action of Some Morphia Derivatives," by J. v. Mening.

By way of comparison with respect to their solubility in water at the ordinary temperature, the commoner salts of morphia and its derivatives are classified as follows: (1) Codeinæ phosphas, 1 : 4, acid reaction, hence painful when injected; (2) Dionin, 1 : 7; (3) Codeinæ hydrochloras, 1 : 20; (4) Morphiæ hydrochloras, 1 : 24; (5) Codeine alkaloid, 1 : 78; (6) Peronin, 1 : 133; (7) Ethyl-morphia, 1 : 286; (8) Morphia and (9) Heroin, nearly insoluble. Dionin possesses, accordingly, the greatest solubility among the bodies forming the subject of this article.

MINUTES OF THE PHARMACEUTICAL MEETING.

The first of the series of Pharmaceutical Meetings for 1899–1900 was held Tuesday, October 17th, in the museum of the College, with Prof. Joseph P. Remington as chairman. The meeting was well attended, and it is to be hoped that a like interest will be manifested in each of the subsequent meetings of the series. The occasion furnished a special opportunity for Philadelphia pharmacists in that two of the speakers were from a distance.

Dr. Clemens Kleber, chemist for the firm of Fritzsche Brothers, of New York, was first introduced, and read a valuable and interesting paper on "The Analysis of Essential Oils," which will be published in full in a later issue of this JOURNAL.

The author called attention to the fact that, notwithstanding the numerous contributions of many of the most eminent chemists, the chemistry of the essential oils is still far from being concluded, and in this connection he enumerated some of the problems arising at the present time. Details of methods of analysis, together with descriptions of devices which the author had found

practicable in carrying out the various processes of distillation, etc., were then given, with the statement that it is impossible to formulate a fixed scheme whereby all analyses of essential oils can be conducted. An appendix of the paper contained an index of the more important components of essential oils, together with the melting and boiling points of such of their derivatives as are serviceable for their identification.

In answer to a question by Professor Remington, as to the variability in specific gravity of essential oils collected at different times of the year, Dr. Kleber said that there is a difference in this respect, but that, owing to their greater yield at certain seasons, not much attention had been paid to this question.

Prof. John Uri Lloyd, of Cincinnati, whose versatility as a writer and thinker on both scientific and philosophical questions is so well known, was present and made a short address on the early history of medicine in America, with special reference to the origin of eclecticism.

After some rather happy preliminary remarks incident to the occasion, Professor Lloyd proceeded to give the early record of schools of medicine in America, beginning with the year 1798. He said that perhaps the first man to study our native materia medica was a talented old German named Schepf, who came as a Hessian soldier to serve in the army of Cornwallis. He afterwards went through the country collecting medicines, and when he went back to Europe published the results of his labors in the Latin language. The first English work on materia medica in this country was that published by B. S. Barton, of the University of Pennsylvania, in 1798. In 1801 a second edition appeared, and in 1804 a second part to the work was published. Following Barton came a man belonging to the irregular school of medicine—Samuel Thomson. He was stern, dogmatic and irregular in every sense of the word. He was opposed to the colleges and believed in setting aside the old teachings. His great precept was that heat is life and cold is death. His medicines were numbered from 1 to 12, his "No. 6" being the compound tincture of myrrh. He believed in lobelia and capsicum, and a course with Thomson meant sweating, vomiting, etc. That he was earnest and honest may be believed from the fact that he died under his own treatment. He was much persecuted and was put in jail in Massachusetts for giving lobelia to a patient who died subsequent to the treatment. He afterwards made a tour of Ohio and granted patents to practice medicine in accord with his system of medication, providing the party would buy his book and pay the price, which was $25.

Thus it was that the present patent system originated. Though we may criticise his methods, he was kinder than the regular physicians at that time, who practised bleeding and other similar harsh treatment. Thomson came as a reformer in opposition to them, and suffered much persecution by reason of his aggressiveness.

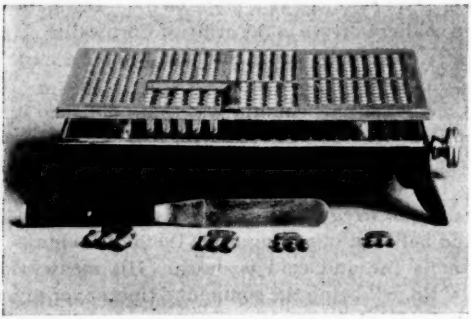
Then came Beach, who proposed even to reform Thomson. His methods were kindlier, and very soon the followers of these two were antagonistic, and they in turn were opposed by the regulars. But the new system developed, and as an outcome an Eclectic School of Medicine was established at Worthington, O., which was the first attempt to teach systematic medicine in central Ohio. Thus it will be seen that there was a difference between Thomsonianism and eclecticism. At this point Professor Lloyd called attention to a very

prevalent but erroneous opinion in regard to eclecticism. He said that it is a mistake to suppose that eclectics will not use minerals. They will use any medicine that will do the work. It is not the use, but the abuse of harsh remedies which they oppose. For example, they found that calomel was being used to an undue extent, and in its stead suggested the use of podophyllum and other more kindly medicines.

In this connection it is of interest to state that the most persistent efforts have been constantly made by eclectics to develop the American materia medica. They have given preference to American productions when possible, and have faithfully and systematically studied our indigenous remedies, giving the result to the world of medicine.

At the present time there are probably 10,000 practising physicians belonging to the eclectic school, and probably 100,000 belonging to the regular school, while Thomsonianism, as such, no longer exists, the name having been changed to physio-medical.

Further commenting on the principles of the eclectic school, Professor Lloyd said that eclectics aimed to be very liberal, but that their cause had suffered on



this very account; that it had been injured by quacks who called themselves eclectics, a quack being, according to his definition, a man who pretends to cure incurable diseases. He said that the code of ethics of eclectics is the golden rule. They claim that any one needing the physician's help should receive it.

Finally the speaker said that the regulars and eclectics are not as friendly as they might be, but kindlier than they have been. He believed that there is room enough for all to work along various lines of research and for humanity. The prominent schools of medicine, the homeopathic, the regular and the eclectic, are growing to recognize the merits of each other and to let the bad go by.

Professor Remington said that he had listened with a great deal of interest to the address, and that he certainly believed, as the speaker said, that as we grow older we become more tolerant, and that all schools are becoming more liberal.

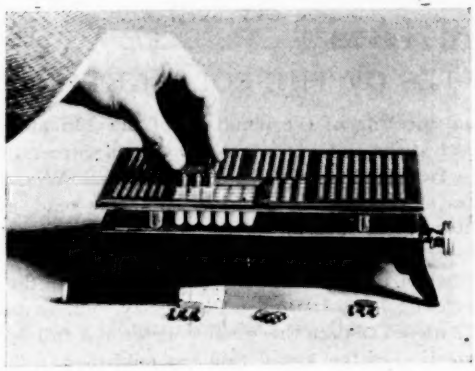
Dr. C. B. Lowe said that Professor Lloyd's remarks took his memory back to a town in New Jersey, and to a small sign, "Thomsonian Drug Store," which was the only one he ever saw.

Frederick T. Gordon, apothecary at League Island Navy Yard, made some

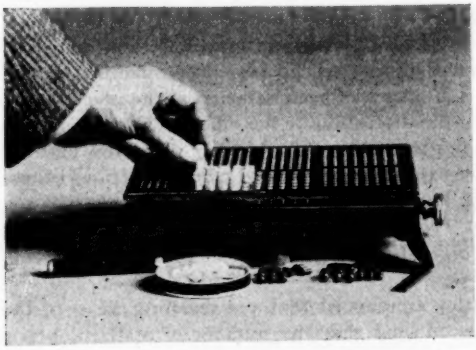
interesting remarks on "The Use of Wood Pulp Sheets as a Substitute for Flaxseed Meal and other Substances in Poultices; also a Few Other Uses for the Material" (see page 525).

Following was an exhibition of specimens, apparatus, etc.

Professor Remington called attention to a new form of capsule filler, the invention of Mr. Ihrig, of the firm of Emanuel & Ihrig, of Pittsburg, Pa. The



apparatus consists essentially of a metal base having a horizontal surface, surmounted by another metallic plate or table having perforations for holding the various-sized capsules, and which may be raised or lowered, as desired, by a screw adjustment. When in position for filling, the lower portion of the capsules should rest on the lower table, and the top part should be slightly below the surface of the upper table. After distribution of the powder with a spatula,



it is pressed into the capsules with a triple punch which accompanies the apparatus. In order to put on the caps the top table is lowered, which brings the top of the capsules above the surface. The accompanying illustrations show the several steps of the operation.

Joseph W. England exhibited a Gilchrist fruit jar, and spoke of its adaptability for preserving museum specimens owing to its wide mouth and the special construction of the cap in forcing out the air.

Among the specimens exhibited were unpeeled colocynth, yam starch used as an adulterant of ground mustard, and globular masses composed of the hairs of nux vomica, formed from the powdered drug by the process of sifting, all of which were received from Messrs. Gilpin, Langdon & Co. An aloes plant was exhibited, which was grown by Prof. Henry Kraemer, from a cutting obtained last year from Barbadoes by Mr. C. G. Lloyd, of Cincinnati.

On motion, the meeting adjourned.

FLORENCE YAPLE, *Secretary pro tem.*

MINUTES OF THE COLLEGE MEETING.

The semi-annual meeting of the members of the Philadelphia College of Pharmacy was held at the College, 145 North Tenth Street, on Monday, September 25, 1899. Twenty-three members were present, Wm. J. Jenks presiding. The minutes of the meeting of June 26th were read, and approved as read. The minutes of the meeting of the Board of Trustees for September were read, and approved as read.

Mr. F. W. E. Stedem read the report of the delegates to the meeting of the American Pharmaceutical Association, at Put-in-Bay, and, on motion, the report was received and ordered to take the usual course. (A full report of the proceedings of the meeting of the Association was published in the October number of this JOURNAL.)

Professor Remington called attention to the meeting of the International Pharmaceutical Congress, to be held in Paris in the summer of 1900; and also to the Pharmacopœial Convention, to be held in Washington, D. C., in May, 1900, which will have a larger number of pharmacists in attendance than ever before, due to a more liberal recognition of the claims of pharmacists for representation in this convention. He also stated that in view of this fact it was the sense of the Put-in-Bay meeting that it was desirable to hold the next meeting of the American Pharmaceutical Association in an Eastern city convenient of access to Washington, immediately after the close of the Pharmacopœial Convention, and, as the Association had not met in Richmond, Va., for many years, that city had been selected as the place of meeting, the exact date being left to the discretion of the officers of the Association.

Professor Remington spoke of the feeling of sorrow and sympathy for Professor H. Vin Arny that was manifested when his serious illness became known to the meeting at Put-in-Bay.

An election of Trustees being in order, Messrs. Harry L. Stiles, Joseph W. England and George M. Beringer were unanimously re-elected for a term of three years.

Professor Sadtler announced that the teaching year of the College would begin on October 2d, and that the number of matriculants was considerably in excess of those registered at the same time last year.

Professor Remington announced that Mrs. Mary Powers Harris had endowed a scholarship in the College in memory of her father, Thomas H. Powers. The scholarship provides for the education of one student each year at the College. This announcement caused great satisfaction to the members, and the hope was expressed that other endowments would follow.

On motion, the meeting adjourned. W. NELSON STEM, *Secretary.*